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International Reference Life Cycle Data System (ILCD) Data Network

Management of UUID and version number of data sets

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1 Overview / summary

The **ILCD reference format** serves to support sound documentation, exchange and updating of LCA data sets, i.e. Process, Flow, Flow property, LCIA method, Unit group, Contact, and Source data sets, as well as external documents (e.g. attached method reports, flowcharts, ...).

For **unique technical / IT identification of the data sets**, the UUID and version number of the data set are used.

This document provides the guidelines of how to create and change UUIDs and version numbers of data sets. It includes also a naming convention for the data sets if saved as xml formatted files in file systems (e.g. in a MS Windows or other file system on a hard disk) that is to be used when publishing data sets via the ILCD Data Network. It **addresses** LCA data set developers, managers of LCA databases, and LCA software tool developers.

Version numbers are counted up if a changed data set version is intended to fully replace the former version without changing the meaning of the data set ("non-semantic changes"). This is the case e.g. when it was improved or error-corrected in a way that did not change the scope, year, quality-level of the data set. Examples are that the documentation was corrected or completed, if a review was performed and is added in the documentation, if the inventory is corrected or improved, etc. If however a data set represents a different scope (see below under “UUID”) or if it reaches a different quality ambition level (especially for Process and LCIA method data sets, e.g. changing from a “ILCD - basic quality” Process data set to “ILCD - high quality”), and both versions shall be accessible to users, this should result in assigning a new UUID (see below).

Different **UUIDs** are assigned for each data set that represents a different object or has otherwise a different scope ("semantically changed data set"). This applies for example if another product or technology, substance, organization etc. is represented by the data set, but also, e.g. for Process data sets if the data sets represents a different year, a different geographical scope, etc. Or, if different method principles (e.g. attributional vs. consequential modeling) render the two data sets systematically different and both data sets should be made accessible for different applications.

For storage in file systems, it is recommended that the **XML formatted data set files** should be named using exclusively the UUID (pattern "UUID.xml" with the UUID given in small letters (e.g. 838aaa23-0117-11db-92e3-0800200c9a66.xml). The data set version number should not anymore be included in the file name, as this has let in the past to the necessity to update all directly and indirectly referencing data sets if for one data set (e.g. a flow) the version number was changed.

Any reference among ILCD formatted data sets (e.g. from a process to the flows it carries in its inventory) can include the **version number** of the referenced data set in the distinct field versionNumber that forms part of the global reference. Per conventionem is the lack of giving a specific version number to be interpreted that the latest version of that data set is referenced. This eases updating of data sets that refer to remotely kept data sets (e.g. flows, unit groups etc. without the need to adjust the references when a new e.g. error-corrected version of that data set is available. Where it is necessary to reference to a specific version (as e.g. often useful for an included process data sets or LCIA method data used for calculating included LCIA results) the respective version number should be included in the Global reference.

For **HTML files of the data sets** e.g. for documentation purposes no requirement is set, but only recommendations are given, based on experiences gained. Care should be taken to not put too much naming etc. information into the file name to avoid the automatic cut-off of file names performed under Windows Operating Systems that permit a total of 256 characters for both path (e.g. on a local hard disk) and file name together. It is accordingly recommended to either use the same naming pattern as for XML files or to add only base name/short name and for some data set types the category information in the file name (e.g. Steel_slab_V2A_93a60a56-a3c8-11da-a746-0800200c9a66.html), what can ease browsing the documentation on the hard disk.

Unless the files are managed in a database, the data set version number can be included in the html file name, to allow keeping several versions of the file in the same folder.

More details and the reasoning for these conventions can be found in the respective chapters of this document.

2 Motivation and purpose of these rules

The ILCD reference format serves to support sound documentation, exchange and updating of LCA data sets, i.e. Process, Flow, Flow property, LCIA method, Unit group, Contact, Source data sets, as well as external documents (files or URL).

For unique technical/IT identification of the data sets, the UUID and version number of the data set are used.

At the same time other information is used for identifying the SCOPE of a data set, such as the name, location, LCI method principle etc. Furthermore different data sets on the same product system may exist, e.g. coming from different sources, applying different method principles etc. The question is when a changed data set receives a new UUID and when merely the version number is counted up.

As data sets in XML format can also be stored and to some degree managed in file systems such as on a hard disk, the file naming pattern and its relation to the scope of the data set needs to be defined including its management of changes.

If such rules are not put in place, it will result in errors when duplicating data sets to create new varied data sets based on existing ones, and during updating data sets (including remote identification of availability of new versions and which data sets shall be replaced by which new versions). Also references to data sets in external documentation and reports that use either the technical identification information or the scope information may result otherwise in misinterpretations and errors.

3 Related documents and links

- ILCD reference format
- ILCD Data Network (under implementation / demonstration)
- ILCD Data Network - ILCD-compliance and entry-level requirements
- ILCD “Nomenclature and other conventions”

The documents and IT packages can be accessed currently under http://lct.jrc.ec.europa.eu

4 Scope of the rules of this document

- **ILCD data set types (all):**
  - Process
  - Flow
  - Flow property
  - LCIA method
  - Unit group
  - Contact
  - Source
  - As well as external documents (any file type or URL)
- **xml file names**
- **general recommendations for file names of pre-generated html files for documentation purposes**

5 General considerations

UUIDs must be unique for each data set of a DIFFERENT SCOPE or come from a different source (i.e. be semantically different - details see below in this paragraph).

Version numbers should reflect a change of a data set which still has the SAME SCOPE (being hence semantically the same), e.g. the version number was counted up in consequence of a more complete documentation, of a bugfix, an additionally performed review, etc. (! Note that the version number of a data set numbers the versions of that data set, not of the ILCD format version in which it is provided.)

More detailed considerations - exact lists per data set type are given in the following sub-chapters: Among others, a process data set has a different scope in the above context if one of the following has been changed: the intended geographical, technological, or time representativeness. I.e. if the represented object is a different one, from a different time, or a different region/place. Note that this does not refer to how the object was modelled and which e.g. geographical representativeness has been achieved for a process data set, but which one is stated as being represented, i.e. if better data is used to improve a data set towards better representing a geographical region, it will still keep the same UUID. This is unless the data set is published with a different quality-level, which in turn implies it should receive a new UUID. Also any correction in the inventory, of typing mistakes, or extension/improvement of the documentation is NOT changing the UUID, as it all relates still to the same object. A data set is however NOT anymore representing the same object if the process data set is representing another year, or a (slightly) different product, or the same product but from another stated region (e.g. EU-27 instead of EU-25). The same applies if e.g. an emission would relate to another sub-compartment (e.g. “emissions to fresh water” instead of “emissions to water”); analogous logic applies to the other data set types. In all such cases a new UUID will have to be assigned.

A new UUID should furthermore be assigned, if the data is modelled in a methodological different way (e.g. attributional vs consequential), e.g. to meet the requirements of another Compliance system which may also imply to use systematically different background data to obtain another quality of the data set. Also, data sets with different quality/completeness levels etc. can be assigned different UUIDs, unless the improved version is intended to replace the former one, but not both are offered alternatively. In this context also data set variants with different copyright/access conditions will receive different UUIDs, while not data sets provided in different formats than the ILCD format, unless the data set documentation or inventory has changed.

Also data sets on the same process/product but developed in different contexts, e.g. under a different commissioner, project, or by different experts, or having

different owners will have different UUIDs, but this will happen automatically, as they are developed independently.

Data sets will not get an new UUID, if e.g. different language information is added, i.e. expanding the documentation, or if a review was added (unless this has other implications on the data set scope and especially if both versions are intended to be used independently compared to a mere replacement of the former version).

6 Management rules for UUID and version number of data sets

6.1 Data sets with a different scope (i.e. UUID changes)

Scope-relevant changes in the data set as reflected by changes in the following fields (UNLESS the field content is only completed/added or bug-fixed) in the respective sub-chapters **should typically result** in a data set with a different scope and result **in a new UUID**. This need is to be judged by the data set developer for the specific case.

6.1.1 Process or LCI result data set

- **Base name**
- **Treatment, standards, routes**
- **Mix and location types**
- **Quantitative product or process properties**
- **Class**
- **Location**
- **Reference year**
- **Type of quantitative reference**
- **Type of data set**
- **LCI method principle**
- **LCI method approaches**
- **Compliance system name**
- **Copyright** (if new variant to be used but old one still accessible)
- **Access restrictions** (if new variant to be used but old one still accessible)
- (Time representativeness description)
- (Technology description including background system)
- (Geographical representativeness description)

- (Modelling constants)
- (Data completeness principles)
- (Data selection and combination principles)
- (Data treatment and extrapolations principles)
- (Data source(s) used for this data set (source data set))
- (Completeness product model)

The fields above in brackets can also be used to give the data set a new scope, i.e. creating variants of the data set; this is to be decided case by case.

Note that data sets may exist that are identical in scope as they e.g. relate to the same commodity, but have been prepared and published by different organisations; these of course also have different UUIDs. The related fields for such cases are:

- **All fields in sub-section "Commissioner and goal"**
- **Data set generator / modeller (contact data set)**
- **Owner of data set (contact data set)**

Other fields may also indicate a different scope to the data set; however, this would typically result that also at least one of the above listed fields would change consequently (proper documentation assumed) why not all fields are listed here.

6.1.2 Flow data set

- **Base name**
- **Treatment, standards, routes**
- **Mix and location type**
- **Quantitative product or process properties**
- **Class (or: Elementary flow category for elementary flows)**
- **Location** (Note: this field is not actively used by the ILCD system)
- **Reference year**
- **Type of flow**
- **Owner of data set (contact data set)**

- **Reference flow property** (This for a different reason: while it is still the same data set, this step involves otherwise a chance for errors in data exchange/conversion)

Other fields may also indicate a different scope to the data set; however, this would typically result that also at least one of the above listed fields would change consequently (proper documentation assumed) why not all fields are listed here.

6.1.3 Flow property data set

- **Name of flow property**
- **Owner of data set (contact data set)**
- **Referenced "Unit group" and related "Reference unit"** (This for a different reason: while it is still the same data set, this step involves otherwise a chance for errors in data exchange/conversion)

6.1.4 Unit group data set

- **Name of unit group**
- **Reference unit** (This for a different reason: while it is still the same data set, this step involves otherwise a chance for errors in data exchange/conversion)

6.1.5 Contact data set

- **Name of contact**

6.1.6 Source data set

- **Source citation** (Note: such changes will occur very seldom)

6.1.7 LCIA method data set

To be defined.

6.2 Data sets with the same scope (only version number changes)

Changes in all other fields (and completion or repair entries in the above listed fields) **of all data set types** will typically not change the scope of a data set (i.e. the data set is semantically still the same). I.e. completing documentation, fixing bugs in the data or documentation, improving the inventory including for LCI results to recalculate the underlying product system model with the result of "better" data sets with changed Input/Outputs flows and values etc. **should only result in changed version numbers.** The same applies analogously for all other data set types.

The version numbers in the ILCD reference format have the following pattern:

<XX.XX.XXX>

- The **first two digits** identify main releases of a data set (e.g. **03.00.000**). It will typically be set manually.
- The **second set of two digits** identify minor revisions, which however result in publishing the new version of such a data set (e.g. **03.01.000**). It will equally typically be set manually.
- The **third set of three digits** is meant for in-house use during developing and documenting a data set, i.e. typically not for new published versions. (**03.01.054**). For practical purposes at data developers and practitioners, it should be considered to have the LCA software tool automatically count up the numbers each time the data set is saved. Depending on the database-internal object handling mechanisms, the maximum possible 1000 versions should usually by far do for this purpose; a further counting with the last digit of the second set of digits could help otherwise.

Additional comment: Reflecting on the typical life time of a data set (typically a few years) and the frequency of minor and larger updates of the SAME data set (often between any few months and any 1 to 2 years), it is suggested to jump for data set releases always to the next higher digit in the first or second set of digits (i.e. keeping the digits in the third set as "000" for all published versions). This also helps in-house to easily differentiate between published versions and in-house further developed versions.

7 XML and HMTL file names and paths

7.1 File variants and naming considerations

The following recommendations are built on experience gained; they are by no means mandatory.

When storing data sets in the ILCD format, the resulting XML files can be stored in two ways: in the LCA software, where they were created in the respective specific internal database, in the data storage engine of the upcoming ILCD Data Network, in an ILCD archive file (i.e. a zip file with specific requirements including on folder-structure and names, as below or a so-called wrapper-file that joins all interrelated single data set xml files into one large xml file), and in a file system of the user's hard disk.

To support such storage in the file system of a hard disk and via web-locations, some specifics are to be considered. These are especially:

- the limitations of e.g. the Windows operating systems for long paths (max 256 characters for names of folder and subfolders plus file name),
- the exclusion of certain characters in the folder and file names in common operating systems including Windows,
- the exclusion of certain characters including blanks in URIs / web-paths and the names of web-located files, and finally,
- the unique identification of the files via its file name as required for storing them in file-system e.g. on a hard disk.

! Note: Especially regarding the limited path length in Windows makes it necessary to users to store the html variants of the ILCD formatted data sets high in the folder-structure, as file names can run to be very long if no rule is found to counteract this. The combination of a substance name and emission compartment plus UUID and version number can otherwise end up as e.g. Carbamic_acid____dibutylamino_thio_methyl-__2_3-dihydro-2_2-dimethyl-_Emissions_to_agricultural_soil_6a655d11-9967-11da-a72b-0800200c9a66_01.00.001.xml).

Also, it is foreseen to offer an alternative version of the database to ease access to the documentative meta data: as html files after having applied the stylesheets to the XML files. This version has the advantage of being much faster and more stable in display in web-browsers compared to the on-the-fly generated files from the XML originals. These pre-generated HTML files should only be used for documentation purposes.

Different naming patterns for xml and html files do not mean a problem, as long as the references among the xml files and among the html files work correctly. Of relevance are the names for the xml files; the pattern suggested for html files is only a general recommendation.

The following naming rules for the filenames and the folder names and folder structure consider these requirements.

7.2 Folder structure, ILCD archive, and relative referencing among XML and HTML files

The following folder names and structure and required for a proper working of e.g. the ILCD editor and different patterns may also cause problems with third-party LCA software that works with the ILCD format. However, apart from this their use is recommended only and not mandatory.

The cross-referencing among the xml-files within the same archive uses relative paths. The folder structure used is as follows: Each data set type has one, separate folder under a common root path that must bear the name "ILCD" as root in the zip file to yield a valid "ILCD archive" file. The following table shows the mandatory folder structure and names. An ILCD formatted database with the corresponding xml files placed in the respective folders is made an "ILCD archive" simply by zipping the while set of folders and files:

- **ILCD**
    - **processes**
    - **flows**
    - **flowproperties**
    - **lciamethods**
    - **unitgroups**
    - **sources**
    - **contacts**
    - **external_docs**

Notes:

- it is recommended to keep the schema and stylesheet files as well as ILCDClassification.xml, ILCDFlowCategorization.xml and ILCDLocations.xml files in this package and in the same folder places (as they are delivered e.g. in the ILCD

reference elementary flows package or the ELCD database package). The recipient of this archive can in that case - after unpacking it onto his/her hard disk - directly view any data set in the web-browser simply by double-clicking on the data set xml file.

- there is one folder named “external_docs” for external documents, such as pdf-files, xls.tables, pictures etc. that are referenced in XML files and can be attached during data exchange.

Naming principle (mainly relevant for suggested HTML file name-pattern)

The file name has to fulfill the rules for filenames under Windows and other PC operating systems. As it is also foreseen to be used for the data set’s permanent URI, it furthermore has to be web-conform. For these two reasons blanks and certain other characters in the file name are to be replaced e.g. by underscores “_”: The characters ()><[]{+:;,./ &%* are hence replaced e.g. by _ (please note, that “-“ are permitted and should not be replaced, as they are part of the UUID No pattern; blanks are generally to be replaced.

7.3 XML files

7.3.1 XML file names

The following conventions are built on experience gained. They are mandatory exclusively for use in the ILCD Data Network.

As all files of the same data set types are stored in the same folder, the files have to have a unique naming. The data set’s UUID together with its version uniquely identify each data set and guarantee unique filenames. However, for reasons explained below, the version number is not anymore to be used in the file name. The file name pattern to be used for the **XML files** is accordingly**:**

UUID.xml

Considerations/Notes:

- a name only with the UUID number makes it impossible to have files with the same UUID but different version numbers in the same XML archive file or on the hard disk. This is a disadvantage. In the past, it was hence a convention to include the version number into the file name. This has led to the following and more relevant problems that led to the necessity to change this convention to the form presented in this document: whenever any referenced data set (e.g. an elementary flow) is updated all directly and indirectly referencing data sets equally need a version number update, since the changed reference means a change in the referencing file. With the new convention that global references can be done exclusively to the UUID

file name (whether stored locally or at an URI on the internet), these indirect changes are not required anymore.

- the main "environment" for the ILCD formatted data sets are database IT systems that can handle files differently than in the simple file system on a hard disk and have no problem in managing the data sets with whatever convention is applied for the file names.

7.3.2 Permanent URI of data sets

The permanentDataSetURI for a data set should bear the **www-paths plus the xml-files' folder path plus the xml file name**, e.g.: http://www.mysupercompany.com/datasets/MyILCD-DB/processes/51a61b56-a3c8-11ea-a146-0902200b9a66.xml for a virtual process data set that could be part of a data set provider, made accessible online. A request for such a data set, would per conventionem return the latest version of that data set. If the request (via Java or PHP) would transmit the version number as additional parameter, that specific version of the data set - if available - could be transferred.

7.3.3 Referencing among xml-files

Accordingly, a flow data set (correctly located in the “flows” folder) would reference to a flow property (e.g. "Mass", correctly located in the “flowproperties” folder) either **via its relative path** as:

../flowproperties/93a60a56-a3c8-11da-a746-0800200b9a66.xml

or via its **absolute path/URI** (i.e. as a remote resource on the Internet) as:

http://lca.jrc.ec.europa.eu/lcainfohub/datasets/ilcd/flowproperties/93a60a56-a3c8-11da-a746-0800200b9a66.xml

Notes:

- the ILCD reference format foresees an alternative mechanism to refer to linked objects as part of the Global reference set of fields: next to the relative or absolute path, alternatively the UUID, version number and type of data set (e.g. flow property) can be given. It is however recommended to use BOTH mechanisms jointly to refer to a data set to ensure fast identification and support identification by tools that use only one of the mechanisms. As mentioned more above, the version number should only be given if a specific version of a reference data set is required.

- all data sets of the ILCD reference elementary flows, flow properties, unit groups and the few included source and contact data sets should be referenced via absolute path/URI.

- it is suggested to use the same folder structure for storing the data sets in a permanent address (e.g. on the internet), as already indicated above in the chapter on the permanent URI of data sets.

7.4 HTML files

The following recommendations are by no means mandatory and e.g. the same file names as for the XML files (i.e. UUID.xml) or any other pattern can be used.

While pre-generated HTML files are of secondary relevance as only serving for a quick display in web-browsers, but not for import/export among LCA software, some recommendations are given on the file names, reflecting on experiences made.

For the html file names, which should ideally be human readable in order to also allow the user to quickly find data sets in his or her file system e.g. via the Windows Explorer, a “readible” name is very helpful. Here the data set’s Name (or at least its Base name) should be used (for some data set types together with the Class/Category of that data set) as further element of the filename. ! The above is **not necessary/recommended if** the access to these html files is supported via a tool that allows to display a human readable name; in that case the analogous naming pattern as used for xml files should be used (i.e. UUID.html).

! Warning: It should be noted that the name pattern suggested below can in theory produce very long file names (maximum is 100 + 1 + 100 + 1 + 100 + 1 + 100 + 1 + 36 + 9 + 5 = 454) that cannot be handled in standard file systems under by MS Windows operation systems (e.g. Windows Explorer with an absolute path-length limit of 256 characters, i.e. including the folders-path where the file is stored). Mechanisms should foresee to cut the file name to a manageable length that also considers that the folders of the file system need a number of characters, e.g. by cutting the name-components(!) part of the file name to a maximum of 180 characters, leaving the UUID and version number complete (Note that, as UUIDs and version number will always differ, no double entries can be created in this process).

Details on the proposed naming rules are given for each data set type:

7.4.1.1 Process or LCI result data set

The name of a file is generated e.g. as follows:

<baseName>_<treatmentStandardsRoutes>_<mixTypeAndLocation>_<functionalUnitFlowProperties>_<UUID>_<dataSetVersion>.html

Resulting file names are automatically created as e.g.:

- Power_grid_mix_AC_consumption_mix_at_consumer_220V_5bb3d3f2-9a1a-11da-a72b-0800200c9a66_01.01.000.html

7.4.1.2 Flow data set

Product and Waste flows

Identical to Process or LCI results.

Elementary flows

As elementary flows and their categories can result in very long file names, and as these files are usually not opened directly by users but only indirectly via references in process datasets, it is recommended to use only the UUID and version number:

<UUID>_<dataSetVersion>.html

Resulting file names are automatically created as e.g.:

- b0db636f-9967-11da-a72b-0800200c9a66_02.01.000.html

7.4.1.3 Flow property data set

For Flow properties, the Category is not required in the filename, as the data set name itself is sufficiently clear (or also the name can be left out, leaving only the UUID and version):

<baseName>_<UUID>_<dataSetVersion>.html

Resulting file names are recommended to be formed as e.g.:

- Mass_93a60a56-a3c8-11da-a746-0800200b9a66_01.01.000.html or
- 93a60a56-a3c8-14da-a746-0800200c9a66_01.01.000.html

7.4.1.4 Unit group data set

For Unit groups, the category is not required in the filename, as the data set name itself is sufficiently clear (or also the name can be left out, leaving only the UUID and version):

<baseName>_<UUID>_<dataSetVersion>.html

Resulting file names are automatically created as e.g.:

- Units_of_energy_93a60a57-a3c8-11da-a746-0800200c9a66_01.01.000.html or
- 93a60a57-a3c8-20da-a746-0800200c9a66_01.01.000.html

7.4.1.5 Contact data set

For Contacts, the short name is recommended instead of the potentially very long full name. The category is helpful in the filename:

<shortName>_<class>_<UUID>_<dataSetVersion>.html

Resulting file names can be automatically created as e.g.:

- Boustead_Organisations_5bb337b0-9a1a-11da-a72b-800200c9a70_01.01.000.html

7.4.1.6 Source data set

For Sources, the short name is recommended instead of the potentially very long full name. The category is helpful in the filename:

<shortName>_<class>_<UUID>_<dataSetVersion>.html

Resulting file names can be automatically created as e.g.:

- LCI-Study-Report-XY_monograph_0bb337b3-9a1a-11da-a72b-0800200c9a68_01.01.000.html
- Flowchart_Power_grid_mix_Germany_Images_5bb337b3-9a1a-11da-a72b-0800200c9a65_01.01.000.html

7.4.1.7 External documents

For external documents (e.g. Adobe Acrobat and MS Word documents, Picture files, MS Excel tables etc.) its is suggested to use the same filename as for the corresponding source data set, except for the file extension, which should of course stand for the required file type:

<shortName>_<class>_<UUID>_<dataSetVersion>.xxx

Resulting file names are automatically created as e.g.:

- LCI-Study-Report-XY_monograph_0bb337b3-9a1a-11da-a72b-0800200c9a68_01.01.000.pdf
- Flowchart_Power_grid_mix_Germany_Images_5bb337b3-9a1a-11da-a72b-0800200c9a65_01.01.000.jpg

7.4.1.8 LCIA method data set

To be defined.

8 Development

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Development and coordination at JRC-IES

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- Marc-Andree Wolf (coordination mid 2005 to early 2012)
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Abstract

Life Cycle Thinking (LCT) and Life Cycle Assessment (LCA) are the scientific approaches behind modern environmental policies and business decision support related to Resource-efficiency and Sustainable Consumption and Production. The International Reference Life Cycle Data System (ILCD) provides a common basis for consistent, robust and quality-assured life cycle data and studies. Such data and studies support coherent policy instruments, such as resource-efficiency measures, Environmental footprinting, Ecolabelling, Ecodesign, Carbon footprinting, and Green Public Procurement. This document supports the International Reference Life Cycle Data System (ILCD) Data Network. It provides the technical provisions for assigning and managing Universally Unique Identifiers (UUID) and version numbers of ILCD-formatted data sets as well as sets conventions for file names of any kind of LCA data sets documented in the ILCD format, namely Process, Flow, Flow property, Unit group, Source, Contact and LCIA method data sets. The principle target audience for this document is the LCA data set developer, LCA database manager, and LCA software developer.

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